Quantifying perceived landscape desirability in human settlements: the case of four communities in Cape Coast, Ghana

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Abstract

Through their natural, aesthetic and cultural attributes, landscapes serve a range of human needs. The perception and value placed on these attributes and services confer desirability on a given landscape. Landscape desirability refers to the extent of acceptability or preferability of the perceived state and functioning of a given landscape in relation to serving the landscape needs of its human inhabitants. This paper presents the idea of, and an approach for quantifying landscape desirability using four communities in Cape Coast, Ghana. A landscape desirability index was derived from four factors (attractivity, wellbeing, dignity, and eco-resilience) based on scores assigned by respondents to three sub-components of each of the four factors. The results show that all the communities scored their landscapes moderately on attractivity, wellbeing, dignity, and eco-resilience, as well as overall landscape desirability. Bare surfaces and contribution to flood and erosion mitigation were a major consideration in respondents' scores of the sub-components of the factors. Nature and beauty (sub-components of attractivity) and sub-components of eco-resilience contributed considerably to the low desirability indices for the communities. This suggests the need to focus on these components in efforts to enhance landscape desirability. The findings suggest a need for wider studies to capture residents' perceptions of their landscapes as an input into participatory landscape planning, transformation and management in Ghana. The quantitative approach applied can easily be adapted and replicated across communities and spatial scales to provide a comparable basis for sustainable landscape transformation in human settlements.

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Introduction

Landscapes, through the provision of multiple ecosystem services, contribute enormously to human wellbeing and environmental sustainability (Wolch, Byrne, & Newell, 2014). Landscapes in human settlements have natural, aesthetic and cultural attributes that shape the way humans perceive, value and interact with the landscape. In the European Landscape Convention (ELC, 2010), which is aimed at protecting European landscapes, landscape is defined as *an area, perceived by people, whose character is the result of the action and interaction between natural and /or human factors*. This definition suggests that while landscapes are shaped by human-nature interactions, they are also a product of human perception. Perceptions of landscapes in human settlements can, therefore, be instrumental in landscape design and management. There can be large variations in the perceptions of landscape attributes and/or functioning. However, these variations can be reduced to a composite desirability index if target variables are used as a basis for capturing the views of landscape inhabitants or users.

In this paper, landscape desirability refers to the extent of acceptability or preferability of the perceived state and functioning of a given landscape in relation to how it serves the landscape needs of its human inhabitants. In other words, it shows the extent to which the inhabitants or users of the given landscape are satisfied with the given landscape in terms of its attributes and associated functioning. This has implications for designing and managing urban landscapes as people's perceptions (or articulation of what is desirable or not) would be key inputs in a participatory context. Based on a review, Matsuoka & Kaplan (2008) grouped human needs of urban landscapes into two broad categories: nature needs (linked with the physical environment) and human-interaction needs (linked to the social setting). In the latter, aspects such as citizen participation in the design process and community identity are important needs of those who ultimately inhabit or use the given landscape. From their review, Matsuoka & Kaplan (2008) found considerable similarities in the components of these broad categories of human needs of urban landscapes across different cultures and political systems. Landscape planning, protection, transformation or management in human settlements are ideal components of physical development and should therefore aim to enhance the servicing of the needs of the landscape inhabitants or users. This

creates a need for approaches that capture public perceptions of landscapes to serve as a genuine input into the process and to give physical expression to local voice and participation (Konrad, Christie, & Fazey, 2011).

Land cover (the material cover of the earth or soil surface) is a crucial component that affects the natural, aesthetic and cultural attributes or qualities of a given landscape. It is the first aspect that makes a visual impression on viewers and informs their perception of landscape desirability. In human settlements, land surfaces can be bare or covered with vegetation (green spaces) or other impervious materials (grey spaces) and are products of urban planning and management (Panagopoulos, Duque, & Dan, 2016; Mensah, 2014; Yankson & Gough, 1999). The matrix and spatial-temporal dimensions of these covers influence the qualities and functioning of the landscape. Through its effect on the natural, aesthetic and cultural qualities of urban landscapes, green spaces are central to people's perception of landscape attributes and functioning (Thompson, 2011; Priego, Breuste, & Rojas, 2008; Li, Wang, Paulussen, & Liu, 2005). Green spaces in urban landscapes support several sustainable development outcomes. They can contribute to air quality (by suppressing dust and removing pollutants), water quality, thermal regulation and food security, and mitigate against flood and erosion (Wolch, Byrne, & Newell , 2014; Eschobedo, Kroeger, & Wagner, 2011; Thompson, 2011; Nowak, Crane, & Stevens, 2006). A review by Laille, Provendier, & Colson, (2014) showed strong evidence of a contribution to physical and psychological health, biodiversity, thermal regulation, and urban attractiveness. In fact, lack of access to urban green cover is associated with mortality (Coutts, Horner, and Chapin, 2010) and other adverse health outcomes (e.g. Villeneuve et al., 2012; Thompson, 2011; Barton & Pretty, 2010). There is evidence, however, that urban green spaces are diminishing in Africa, due in part to the low priority given to such spaces (Mensah, 2014) and rapid, unplanned urbanization (Yankson & Gough, 1999). Perceptions of a landscape can therefore be derived from views on target attributes of land cover and associated intuitive functioning related to people's landscape needs.

In Ghana, urban landscapes tend to evolve chaotically or biologically in tandem with physical development of the urban area due to weak physical planning and land use controls. This chaotic evolution of landscape, together with weak management structures, has resulted in several areas

of urban landscapes being dusty and incoherent, with adverse environmental impacts (Yankson & Gough, 1999). While the adverse impacts of such landscapes on the health and wellbeing of its inhabitants are a subject of considerable interest in some regions (Khan & Strand, 2018; Dai 2011), the same cannot be said of West Africa, for example, where dust pollution and morbidity rates are higher (De Longueville, Hountondji, Henry, & Ozer, 2010) and over 20% of infant mortality is due to respiratory infections (Bryce, Boschi-Pinto, Shibuya, & Black, 2005; Morris, Black, & Tomaskovic, 2003). Due to the considerable scope for landscape transformation in human settlements in Ghana, information on how local residents perceive their landscapes, which is often unknown (Konrad et al., 2011), is an important seminal step. This paper quantified the self-ratings of the perceived landscape desirability of residents of four communities in Cape Coast, Ghana. Here, landscape desirability comprised four factors derived from a broader consideration of the literature (e.g. Matsuoka & Kaplan, 2008 and references therein): *attractivity, wellbeing, dignity,* and *eco-resilience*, each of which has three sub-components.

Literature Review

Landscapes embody and express the state and desires of human development. The value of landscapes to people arises from its linkage with identity and sense of place or community, quality of life, and context for planning changes in land use and physical development (Scott, 2006). This makes landscapes an important consideration in urban planning and development, and multi-stakeholder processes are necessary to capture the perceived needs and preferences of especially those who inhabit or will inhabit a given landscape (Matsuoka & Kaplan, 2008). Because public perception is not monolithic and static, capturing the landscape perceptions of stakeholders presents formidable conceptual, methodological and institutional challenges (Scott, 2006). Even more challenging is moving beyond identification to measuring a collection of preferences as a composite that can be incorporated into policy and development planning. In this regard, assessment of landscape desirability (as a composite expression or indication of preferences or perceived usefulness of a landscape to inhabitants) can be useful for capturing and incorporating the landscape needs of people into planning, management and policy decisions. This relates to quantifying concepts of perception of the physical landscape, focusing on aspects such as physical

qualities and the lived or embodied experiences and expressed preferences of inhabitants for components or services from the landscape (Scott, 2006). A gap in landscape desirability and people's experiences of urban transformation can lead to loss of identity, community life or structure and several environmental, social and economic problems, including community fragmentation, alienation and distrust (Scott, Shorten, Owen, & Owen, 2009).

Explicit use of the term 'landscape desirability' in research is very limited even though aspects can be derived from the literature. Analysis of the nature and human-interaction needs described by (Matsuoka & Kaplan, 2008) and a broad scan of the literature reveal four important dimensions of landscape desirability as used in the current study: attractivity, wellbeing, dignity, and eco-resilience. These relate to the socio-ecological functioning and direct or derived uses of landscapes in urban contexts.

Landscape desirability components

The *attractivity* dimension relates to the scenic beauty (aesthetics) of the landscape derived from the visual appeal, structural and compositional characteristics of the landscape. Most people associate landscapes with beauty. A study by Konrad et al. (2011) on how people perceived landscape showed that most respondents (63%) associated landscape with fields, flora, fauna and scenic beauty. The visual and cultural aesthetics mold a holistic image of natural and cultural coherence and beauty of functional landscapes. This aspect is the primary stimulus for attachment of meaning and value to landscape, significantly influencing choice of place of residence and sense of wellbeing (Scott, 2003). As a result, scenic beauty has for a long time been, and remains, a very important component of landscape resources that humans use and endeavor to improve or preserve. Green cover, as a component of scenic beauty of urban landscapes, serves people's need for connection with nature (Gladwell, Brown, Wood, Sandercock, & Barton, 2013; Matsuoka & Kaplan, 2008). The manifold human and ecological benefits of this connection with nature underpin the increasing research and policy interest in urban green space. It has been reported that, among many factors, connectedness to nature and accessibility are the strongest predictors for people's use of green spaces for physical activity and leisure (Flowers, Freeman, & Gladwell,

2016; Gladwell et al., 2013). This nature connectedness is also strongly associated with pro-environmental behavior in urban contexts (Whitburn, Linklater, & Milfont, 2018).

The second dimension relates to the landscape's contribution to the wellbeing of its inhabitants or users. The contribution of landscapes to health, physical and mental wellbeing in urban environments is established in the literature (Laille et al., 2014; Bratman, Hamilton, & Daily, 2012; Van Dillen, De Vries, Groenewegen, & Spreeuwenberg, 2012). Increased urbanization and poor access to urban green spaces, for example, are associated with mortality (Coutts, Horner, & Chapin, 2010) and other adverse health outcomes, including poor mental health (e.g. Villeneuve et al., 2012; Thompson, 2011; Barton & Pretty, 2010). This contribution to physical and mental wellbeing is underpinned by the structure, visual appeal and accessibility of the landscape. Outdoor physical activities such as walking, biking, and running hinge on the availability of and access to appropriate safe and healthy spaces in the landscape. For example, it has been reported that the so-called 'green exercise' can contribute to better general health (Akpinar, 2019; Duncan et al., 2014), mental health (Mitchell, 2013) and well-being (Olafsdottir et al., 2018; Marselle, Irvine, & Warber, 2013) outcomes than exercise alone. Exposure to landscapes with scenic beauty that permit connection with nature can contribute to mental and physical relaxation, psychological restoration and overall wellbeing (Olafsdottir et al., 2018; Larson et al., 2016; Bertram & Rehdanz, 2015; Laille et al., 2014).

A landscape confers a measure of a sense of dignity (pride and respect from others) on its inhabitants as much as the inhabitants derive dignity and pride from their landscapes. The relationship between environmental quality and human dignity (and by extension human rights) has been articulated, but much research needs to be done to provide stronger linkages to policy, legal and environmental decisions (Townsend, 2015). A landscape provides a context that influences notions of self-esteem and the way the human inhabitant is conceived of by others. It provides the material resources that express or enable the expression of one's dignity, a situation that is often neglected in environmental design and adjudication (Townsend, 2016). As a result, environmental degradation or poor-quality landscape poses a threat to human dignity and rights and addressing the former will amount to serving the latter (Townsend, 2015). In urban contexts, landscapes provide first impressions of status and wealth, and could be a basis for notionally or

formally discriminating between poor and non-poor, or safe and unsafe neighborhoods, and can therefore be a basis for environmental justice. Hammon (2009) argued that the essence of human dignity to instruments of governance should be reflected in all policy, legal and environmental actions. Finally, the *eco-resilience* dimension relates to the landscape's contribution to environmental protection and resilience. Depending on the green-grey infrastructure balance and design, it is known that landscapes can contribute to air quality (e.g. suppressing dust and removing pollutants), water quality, thermal regulation and food security, and mitigate against flood and erosion (Wolch, Byrne, & Newell, 2014; Eschobedo et al., 2011; Thompson, 2011; Nowak, Crane, & Stevens, 2006). Recent interest in the use of green infrastructure and nature-based solutions for addressing environmental challenges such as water treatment and filtering, augmentation of water supplies, reduction of impacts of floods and provision of fresh food, among others, is drawing attention to people's needs in urban landscape design (Matsuoka & Kaplan, 2008).

Study Setting and Methods

Study setting

The study was conducted in four communities in Cape Coast (Figure 1): Amamoma-Kwesi-Mpra (1°17'42.18"W 5° 6'35.56"N), Apewosika-Kokwaado (1°16'45.60"W, 5°7'9.28"N), Akotokyer (1°17'36.28"W, 5° 8'8.61"N), and Kwaprow (1°18'7.02"W, 5° 7'26.98"N). The city of Cape Coast is the capital of the Cape Coast Metropolis (CCM) and the Central Region of Ghana. The CCM covers an area of 122 km^2 and only 23% of its 169,894 inhabitants live in rural areas (Ghana Statistical Service, 2013). The study communities border the University of Cape Coast and, together, make up the largest spatially distinct continuum of communities outside of the core of the city of Cape Coast which is densely built up and has limited space for new development. In addition, even though the selected communities are among the oldest in Cape Coast and predate the University of Cape Coast, they lack planned physical development, unlike the University of Cape Coast. They are vulnerable to floods (especially Kwaprow and Amamoma) and dust pollution. However, the communities are undergoing rapid physical transformation due to the development of facilities to accommodate and serve the students, staff and the associated itinerant workers of the University of Cape Coast. This physical expansion, though currently chaotic,

presents considerable opportunities for planned landscape transformation to a more desirable, sustainable and resilient state comparable to that within the University of Cape Coast. This opportunity for landscape transformation, together with the existing landscape dichotomy between the University of Cape Coast and these surrounding communities, and the disproportionately larger share of bare, dusty, and unaesthetic landscapes in these communities motivated their selection for this study.
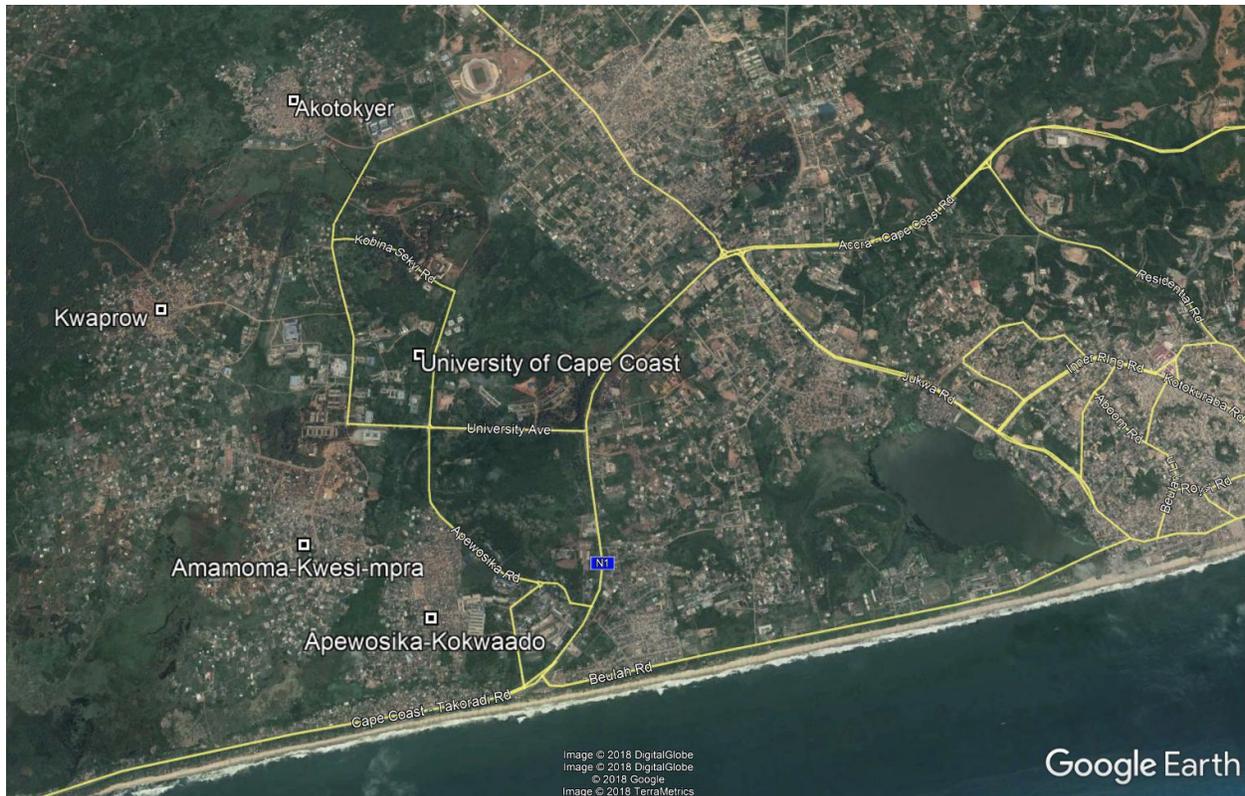

Figure 1: The study communities in the context of Cape Coast. Source: Google Earth (2018).

Data collection and analysis

The study targeted adult residents who live in normal residential facilities, have lived in the communities for at least one year and are not visitors. Thus, those in temporary residential or accommodation facilities (such as hostels for students and other hospitality facilities) were excluded. In addition, only one interview was conducted for an identified household so that adults who were not residents in the given household at the time of interview would not participate in the

interview. The average population of the communities is estimated at about 2500 (CCMA Medium Term Development Plan, 2010), with Amamoma-Kwesi-Mpra being the largest and Kwaprow being the smallest. However, the population of the communities does not differ substantially. Over half of the population is made up of students or temporary residents (Tham-Agyekum, Okorley, & Amamoo, 2019). With this in view, the target population or sampling frame was substantially reduced to a homogenous subset.

A visual inspection of the spatial extent and housing density of the communities was done from Google Earth. Based on images derived from Google Earth, each community was divided into four quadrants by overlaying an empty grid. Simple random sampling was then applied to each quadrant to ensure a fairly, well-distributed spatial coverage of respondents in the communities. Random sampling was applied in each quadrant to ensure a fair chance of each household getting selected and since the sampling frame was considered large. In addition, this method permitted recruitment of respondents willing to participate in the study and easy replacement of those who were unwilling. Using a confidence interval of ±8 (95% confidence level) and a target population of 6000 as the sampling frame for all the communities, the required sample size was estimated at 146. This was distributed equally over the target communities (approximately 37 per community). However, the final sample size was arrived at based on (i) resource availability and time frame of the study (ii) willingness of respondents to participate in the study after the nature and purpose of the study had been explained to them to seek their consent, and (iii) an observation of response saturation. In the end, a total of 130 respondents (representing households in the sampling frame) were interviewed from the four study communities: Akotokyer (38), Amamoma-Kwesi-Mpra (34), Apewosika-Kokwaado (30), and Kwaprow (28).

Face-to-face interviews were conducted, using structured questionnaire, by trained enumerators who visited homes and ensured that a prospective respondent was a resident or a member in that household before administering the instrument. In most cases, enumerators identified the household head in family homes before administering the instrument. In such situations, and where possible, family members provided an agreed score for the components of landscape desirability. This was done to avoid interviewing non-residents in a given community or conducting multiple interviews with the same respondent in different communities as people move easily between the

communities on a daily basis. As indicated earlier, persons who have lived in the community for less than a year were also excluded as they were considered as not having experienced the landscape enough. This was also done to avoid students who change residence between communities within less than a year. In any case, the data collection was done when the University of Cape Coast was on vacation to minimize the inclusion of most students who are non-resident. The instrument broadly elicited data on general characteristics of respondents, respondents' views on their landscape in general, and most importantly, scoring of the four landscape desirability factors via their respective sub-components. The factors and their subcomponents were *attractivity (*green cover, alignment or spatial arrangement of vertical elements, visual appeal*), wellbeing (*mental wellbeing, reduction in illness, and space for active living*), dignity (*fitness of landscape for personal life and status, respect and admiration from non-residents, natural deterrence of environmental abuse) and *eco-resilience* (erosion mitigation, flood mitigation, and soil and water protection).

Respondents assigned scores to each of the sub-components of a factor using a Likert-type scale of one to five, with one being the least and five being the highest, based on their judgement or perception of the extent to which the landscape contributed to a given sub-component.

The data were coded and analyzed in MS Excel (2016). Frequencies of some characteristics of respondents and of scores for the sub-components of the landscape desirability factors were generated. The scores of the sub-components were standardized by dividing them by their respective sample sizes (so that the sum of the scores for a given sub-component equals one). This was done to permit comparability of scores between communities and factors. The factors were then computed as the sum of the mean scores of their respective sub-components. To this end, the maximum score for each factor would be 15, and the resulting values were placed into three classes by the author using natural breaks as there is no existing scale to guide this process: 1-5 (low), 6-10 (moderate), 11-15 (high). The landscape desirability index was calculated as the average of the scores of the factors for each community. The classification regime used for the factors was applied to interpret the landscape desirability index or values.

Results

Some characteristics of the respondents are presented in Table 1. The age of the respondents for all the communities ranged from 18 to 76, with a mean age of 32 years. The ages were grouped into three (under 40 years, between 40 and 60 years, and above 60 years). Akotokyer, Amamoma and Kwaprow had the largest share of respondents under 40 years old, with Apewosika having most of the respondents between 40 and 60 years old (Table 1). Amamoma and Apewosika had more female respondents than males. For all the communities, females accounted for 52% of the respondents. While there are variations between communities, all the communities had a greater share of their respondents who had lived in the community for at least six years. Amamoma, for example, had 16 (12%) respondents having lived in the community for over 10 years. Most of the respondents had had some formal education. Few respondents in the communities had no formal education, with most having had some pre-tertiary education (primary to high or secondary school, including technical and vocational schools). The respondents were fairly distributed between natives (i.e. respondents considered the community their hometown or were born and raised in the community) and non-natives. Akotokyer and Apewosika had more natives than non-native respondents. Overall, 67 (52%) out of the 130 respondents for all the communities were natives.

Table 1: Frequencies (%) of some characteristics of respondents (n = 130)

Community	Age (yrs)			Gender		Duration of residence (yrs)			Education			Native	
	<40	40-60	>60	Female	Male	1-5	6-10	>10	NFE	PT	Tert.	Yes	No
Akotokyer	12	10	8	14	15	8	12	9	2	13	15	16	13
Amamoma	13	7	6	16	10	8	6	12	4	14	8	12	15
Apewosika	6	12	5	12	11	5	11	7	5	9	8	14	9
Kwaprow	11	7	4	9	12	9	6	6	4	11	7	10	12

Note: *NFE* denotes no formal education; *PT* denotes pre-tertiary; and *Tert* denotes tertiary.

In this study, four landscape desirability factors were measured based on scores of their respective subcomponents (Table 2). For nature, respondents across the studied communities mostly gave low to average scores (1-3) indicating very low or very poor to average or moderate presence of nature or contribution of nature to overall landscape and community attractivity (Table 2a-d). In Akotokyer, 13 (34%) respondents gave a score of 2 or 3 while 11 (29%) gave a score of 1 (Table 2a). Only 3% respondents gave a score of 4. In Amamoma, 76% of the 34 respondents gave scores of 1 and 2 to nature (Table 2b). A similar trend is observed for Apewosika and Kwaprow (Table 2c and 2d), with only one (3%) respondent giving nature a score of 1 in Apewosika (Table 2c). Just like nature, scores for vertical elements concentrated around 1 to 3 for all the communities (Table 2a-d). However, unlike nature, vertical elements attracted higher scores of 4 and 5, indicating that some respondents felt satisfied or very satisfied with the spatial arrangement of vertical elements on the landscape. With overall beauty of landscape and community, the most frequent score was 2 for all the communities (Table 2a-d), indicating poor satisfaction with landscape beauty and its contribution to attractivity.

Wellbeing was represented by mental wellbeing, illness and active living. No respondent gave a score of 5 in any of the communities. In Akotokyer, the most frequent scores for mental wellbeing were 1 (45% of respondents), 2 (29% of respondents) and 3 (24% of respondents), indicating a very low to moderate contribution of landscape to mental wellbeing. In Amamoma, 44% and 32% of respondents indicated that the contribution of the landscape to mental wellbeing was low to moderate, with 12% of respondents indicating a high contribution (a score of 4). In Apewosika and Kwaprow, a total of 67% and 71% of respondents, respectively, indicated that the landscape's contribution to mental wellbeing was very low or low (scores of 1 and 2). With the landscape's contribution to reduction in illness, a total of 66% of respondents gave a score of 1 or 2 in Akotokyer, 56% in Amamoma, 63% in Apewosika and 61% in Kwaprow. Some respondents gave higher scores (4 or 5), with the reason that exposure to the dust strengthens immunity and thereby reduces ill-health, or their bodies have adapted to the dust. With space for active living, 37% of respondents gave a score of 3 in Akotokyer, with 26% giving higher scores. Similarly, over 50% of respondents in Amamoma gave moderate to high scores to space for active living. Similar trends were observed for Apewosika and Kwaprow. These scores arose from the fact that respondents felt they could easily walk or cycle through the community without having to worry too much

about vehicular traffic. Young people felt they had some open spaces for playing football though these were not suited for other sporting activities.

Table 2: Frequencies (%) of scores for sub-components of the desirability factors.

a. Akotokyer (n = 38)

Score	Attractivity			Wellbeing			Dignity			Eco-resilience		
	Nat	VE	Bty	MW	Ill	AL	Suit	Res	Det	Er	Fl	S&W
1	29	21	29	45	34	16	32	26	24	42	29	39
2	34	34	39	29	32	21	16	42	21	26	34	34
3	34	24	29	24	18	37	32	21	32	26	21	18
4	3	11	3	3	13	13	16	11	24	5	13	9
5	0	10	0	0	3	13	5	0	0	0	3	0

Note: Nat denotes Nature; VE denotes vertical elements; Bty denotes beauty; MW denotes mental wellbeing; Ill denotes illness; AL denotes active living; Suit denotes suitability of landscape for personal life and status; Res denotes respect; Det denotes deterrence; Er denotes erosion mitigation; Fl denotes flood mitigation; S&W denotes soil and water protection; Avg denotes average.

b. Amamoma (n = 34)

Score	Attractivity			Wellbeing			Dignity			Eco-resilience		
	Nat	VE	Bty	MW	Ill	AL	Suit	Res	Det	Er	Fl	S&W
1	35	18	21	12	24	24	29	29	24	29	38	29
2	41	32	44	44	32	24	32	38	29	29	32	32
3	21	29	29	32	24	21	15	9	26	26	18	26
4	3	18	6	12	18	18	18	18	18	15	12	12
5	0	3	0	0	3	12	6	6	3	0	0	0

c. Apewosika (n = 30)

Score	Attractivity			Wellbeing			Dignity			Eco-resilience		
	Nat	VE	Bty	MW	Ill	AL	Suit	Res	Det	Er	Fl	S&W
1	27	27	33	43	20	23	17	30	30	47	40	20
2	33	30	47	20	43	23	43	33	33	17	33	47
3	30	23	17	23	20	17	10	23	23	27	20	27
4	7	17	3	13	7	7	20	13	10	10	7	7
5	3	3	0	0	0	0	10	0	3	0	0	0

d. Kwaprow (n = 28)

Score	Attractivity			Wellbeing			Dignity			Eco-resilience		
	Nat	VE	Bty	MW	Ill	AL	Suit	Res	Det	Er	Fl	S&W
1	46	29	25	25	21	25	21	39	25	39	36	29
2	36	29	36	46	39	11	29	32	32	36	39	57
3	18	18	25	25	21	21	29	21	29	18	14	7
4	0	25	14	4	11	14	11	7	14	7	11	7
5	0	0	0	0	0	0	11	0	0	0	0	0

Note: Nat denotes Nature; VE denotes vertical elements; Bty denotes beauty; MW denotes mental wellbeing; Ill denotes illness; AL denotes active living; Suit denotes suitability of landscape for personal life and status; Res denotes respect; Det denotes deterrence; Er denotes erosion mitigation; Fl denotes flood mitigation; S&W denotes soil and water protection; Avg denotes average.

Dignity was represented by suitability of landscape for personal lifestyle and status, respect derived from the physical landscape and the capacity of the landscape to deter bad environmental habits like littering. With landscape suitability, a total of 30 (79%) respondents in Akotokyer, 26 (76%) in Amamoma, 21 (70%) in Apewosika, and 22 (79%) in Kwaprow gave a score of 1 to 3. A few respondents gave higher scores, some indicating that the landscape did match their poor status. A respondent in Apewosika commented that poor people are identified, firstly, by their physical environment. On respect, most of the respondents for all the communities indicated very low to moderate scores, implying that the landscape did not bring them much respect from others. Only 6% of respondents in Amamoma gave a score of 5 as few considered the curated green spaces

around their homes to bring them respect. While most respondents indicated that the landscapes in their respective communities did not deter people from littering or throwing wastewater around, a few indicated high to very high deterrence, especially in Akotokyer and Amamoma.

Finally, on eco-resilience, the most frequent scores for all the sub-components and all the communities were 1 and 2, indicating a very low to low contribution of the landscape to eco-resilience. In each community, over 50% of the respondents gave scores of 1 and 2 to erosion mitigation, flood mitigation, and protection of soil and water. Respondents did not fail to express their displeasure with the uncovered surface conditions during rainy or dry periods. Most indicated that the landscape becomes dangerous when it rains as it becomes muddy, slippery and dirty, and open drains are obscured by the turbid runoff from the surface. Persons have to walk in mud and pick up piles of mud on their shoes or feet. During dry periods, persons become covered with dust; sometimes one finds grit in one's mouth and dust in one's nose. A respondent in Akotokyer commented that they eat the dust every day. Erosion was found to be commonplace in the communities.

The scores for the subcomponents were standardized (as relative frequencies) to make the factors comparable between communities and to enable the derivation of probability scores. For attractivity in Akotokyer, scores 1 and 2 accounted for over 50% of the total scores, with the highest being 2 (Table 3). The same can be said about Amamoma and Apewosika. However, for Kwaprow, scores 1 and 2 were the largest. For all the communities, score 4 was highest in Kwaprow. With wellbeing, score 1 accounted for the largest share of the total scores in Akotokyer, score 2 in Amamoma, scores 1 and 2 in Apewosika, and score 2 in Kwaprow. With Dignity, score 3 had the largest share for Akotokyer, while score 2 accounted for the largest share in the remaining communities. With eco-resilience, scores 1 and 2 accounted for the largest share in all the communities. The highest standardized values were obtained for score 2 for attractivity and wellbeing in Amamoma,for dignity in Apewosika and for eco-resilience in Kwaprow.

Table 3: Standardized scores of factors

Community	Score	Attractivity	Wellbeing	Dignity	Eco-resilience
Akotokyer	1	0.2632	0.3158	0.2719	0.3684
	2	0.3596	0.2719	0.2632	0.3158
	3	0.2895	0.2632	0.2807	0.2193
	4	0.0526	0.0965	0.1667	0.0877
	5	0.0351	0.0526	0.0175	0.0088
Amamoma	1	0.2451	0.1961	0.2745	0.3235
	2	0.3922	0.3333	0.3333	0.3137
	3	0.2647	0.2549	0.1667	0.2353
	4	0.0882	0.1569	0.1765	0.1275
	5	0.0098	0.0588	0.049	0
Apewosika	1	0.2889	0.2889	0.2556	0.3556
	2	0.3667	0.2889	0.3667	0.3222
	3	0.2333	0.2	0.1889	0.2444
	4	0.0889	0.0889	0.1444	0.0778
	5	0.0222	0.1333	0.0444	0
Kwaprow	1	0.3333	0.2381	0.2857	0.3452
	2	0.3333	0.3214	0.3095	0.4405
	3	0.2024	0.2262	0.2619	0.131
	4	0.131	0.0952	0.1071	0.0833
	5	0	0.119	0.0357	0

Table 4: The scores of landscape desirability factors and landscape desirability index

Community	Attractivity	Wellbeing	Dignity	Eco-resilience	Landscape Desirability Index
Akotokyer	6.7105	6.8947	7.1842	6.1579	6.7368
Amamoma	6.8529	8.3235	7.3824	6.5588	7.2794
Apewosika	6.5667	7.8	7.1333	6.3667	6.96667
Kwaprow	6.5714	7.8214	7.5357	6.2143	7.0357

Note: Interpretation: 1-5 (low), 6-10 (moderate), 11-15 (high).

For all the communities, the values (indicators) of the factors fell within the moderate class (Table 4). The values for attractivity, dignity and eco-resilience did not differ substantially between the communities. All the communities had values at the low end of the moderate class for attractivity

(Table 4). Amamoma had the highest wellbeing indicator value, followed by Kwaprow and Apewosika. Similarly, the landscape desirability index was higher for Amamoma and Kwaprow, even though all communities had moderate landscape desirability index.

Discussion

Landscape planning and management have not been an explicit part of the discourse on development in Ghana. The dusty land surfaces and undesirable landscapes in human settlements in Africa have been neglected by researchers, policy makers and development planners or practitioners. The same can be said of general landscape studies. The physical environment in human settlements or urban environments contributes substantially to sustainable development outcomes (Panagopoulos et al., 2016; Li et al., 2005) and can be a basis for environmental injustice (Dai, 2011) or spatial inequalities (Wei, 2015). Particularly, a positive association has been established between the physical environment (especially green space) and human health (Hartig, Mitchell, De Vries, & Frumkin, 2014; De Longueville et al., 2010), yet green spaces are declining at an alarming rate in Africa (Mensah, 2014). The landscape is a major component of the physical environment. Through their natural, aesthetic and cultural attributes, landscapes in human settlements serve a range of human needs (Li et al., 2005; Matsuoka & Kaplan, 2008; Priego, Breuste, & Rojas, 2008) that confer desirability on the landscape. Important among these are nature and ecological needs. This paper presents the view that the perception of the ability of a landscape in human settlements to serve human needs confers desirability on that landscape, and that landscape desirability can be quantified so as to inform sustainable landscape transformation into a more desirable state. To this end, the landscape desirability of four communities in Cape Coast, Ghana, was assessed.

Within the communities studied, more than 50% of the respondents considered themselves natives (i.e. they considered the community as their hometown). Most of the respondents were educated and had lived in the communities for at least six years. This suggests a considerable exposure to or interaction with their landscapes and, by extension, the importance of the community's landscape to them and the relevance of their perceptions of landscape desirability. The studied communities had considerable proportions of uncovered and dusty land surfaces. The physical

environment and the settlements are unplanned and there is no explicit landscape management or governance regime in place.

The march towards sustainable development also implies a move towards desirable landscapes that meet the needs of local residents. To this end, information on how inhabitants perceive their landscape's desirability, which is often not known (Konrad et al., 2011), would be an important input into landscape transformation and management from a participatory, inclusive context. In the current study, landscape desirability was derived from twelve variables that represented four factors. Across the communities, respondents gave low scores for all components of attractivity and wellbeing, particularly the sub-components: nature, beauty and mental wellbeing. This indicates that the respondents did not consider their landscapes as putting them in contact with nature, nor as contributing substantially to the beauty of their communities or their mental wellbeing. Even though wellbeing is not easily measurable and is relative, Dinnie et al. (2013) suggest using proxy questions about perceptions of personal experiences, feelings and interactions with the environment. The presence of nature and contact with nature are key human needs that ought to be served by a desirable landscape (Bell, Phoenix, Lovell, & Wheeler, 2015; Hartig et al., 2014; Matsuoka & Kaplan, 2008). The presence of and contact with nature in human settlements are known to promote emotional, mental and physical health (Bell et al., 2015; Laille et al., 2014; Villeneuve et al., 2012; Barton & Pretty, 2010; Coutts, Horner, & Chapin 2010; Matsuoka & Kaplan, 2008), as well as the appreciation of one's physical environment (Matsuoka & Kaplan, 2008). For example, Laille et al. (2014) reported strong evidence of an association between access to green cover and mental health. In addition, a review of several studies by Matsuoka & Kaplan (2008) showed that people have a strong preference for landscaped areas with aesthetic value such as scenic beauty, cleanliness and pleasant sounds. In the current study, respondents expressed their use of and appreciation for a few landscaped areas, which are used as background for photographs and as attractions to children for recreation. The few trees in the communities are used as shade during the day and some realized the value of vegetative cover during rainfall events. Overall, there was a considerable disapproval of the dusty surfaces (during dry periods) and the sediments generated during rainy periods in the communities. The dusty conditions are worsened during the dry season (November to February) when the dry Harmattan winds transport dust from the Sahara and the Sahel to Ghana (Sunnu, Afeti, & Resch, 2008), especially because West Africa is the most

exposed region to atmospheric dust events (De Longueville et al., 2010). The disgust for the dusty surface could explain the difference between the findings of this study and those of Priego, Breuste, & Rojas (2008) who reported that respondents indicated satisfaction with their landscape regardless of the extent of green cover.

Landscapes also confer dignity on the community and its residents. For example, a given landscape or physical environment presents an impression of whether one can litter, urinate or throw wastewater around. This deterrence embodied in landscapes in turn confers respect and dignity on the inhabitants of that landscape. Inhabitants can derive dignity and pride from their landscapes, and command respect because of their landscapes. In the current study, the respondents largely believed that they did not derive much dignity from their community landscapes. A respondent captured the link between landscape and dignity with the following words: "poor people are identified, firstly, by their physical environment. The poor live in dirt". It is important, therefore, to enhance landscape desirability to raise human dignity as part of poverty alleviation and development efforts.

Uncovered land surfaces contribute to adverse ecological or environmental outcomes such as poor quality of air, water and soil, as well as thermal stress, flood and erosion (Wolch et al., 2014; Eschobedo et al., 2011; De Longueville et al., 2010; Sunnu, Afeti, & Resch, 2008; Nowak, Crane, & Stevens, 2006). In West Africa, it has been reported that respiratory infections account for over 20% of the causes of infant mortality (Bryce et al., 2005; Morris, Black, & Tomaskovic, 2003). Apart from the dust contributing to ill-health (Khan & Strand, 2018; Sandstorm & Forsberg, 2008), uncovered surfaces and poor physical environment in human settlements can have indirect health consequences through, for example, poor sanitation practices and the creation of breeding grounds for vectors like mosquitoes. In the current study, the overwhelming majority of respondents indicated that their landscapes poorly mitigated against erosion and flood, and the protection of soil and water. These suggest an awareness of potential contribution of the landscape to adverse ecological or environmental outcomes and the need to improve this situation. Particular references were made by respondents to how easily their communities flooded with muddy water (sediment transport), how certain areas retain muddy puddles for long periods, or how dust is blown into their eyes, mouths, bodies and even rooms.

Based on the approach used in this study, the communities did not differ much in terms of the indicators for attractivity, dignity and eco-resilience, but differed considerably in terms of the wellbeing indicator values. The similarity suggests a common scale of perception of landscape desirability in the communities, perhaps due to their spatial proximity or the similar chaotic appearance of the landscape. The difference in wellbeing arose from the difference in scores for the few spaces for active living. This, in turn, suggests a need to protect and improve these few spaces. For some, the dusty surfaces constrained walkability and use of spaces for leisure or recreation. Nonetheless, all the communities had moderate values for the four factors (indicators) and overall landscape desirability index. Amamoma and Kwaprow had a higher desirability index due to their higher scores on attractivity and wellbeing. This is perhaps due to the proximity to vegetation at the outer boundaries and greater open spaces in these two communities compared to the others. In all, there are higher probabilities for low scores of landscape desirability (and its components) in the communities studied. For all the communities, attractivity and eco-resilience contributed most to scores 1 and 2 which had the highest probabilities (or standardized scores). This suggests that attractivity and eco-resilience are two key considerations for sustainable landscape transformation in the communities studied. It is important to recognize this need for landscape transformation as part of poverty alleviation or urban resilience programmes. The approach adopted in the current study can enable objective and comparable assessments of landscape desirability across communities and at varying spatial scales. The approach is easy to implement and can be used to capture comparable perceptions of residents about their landscapes as an input into sustainable landscape transformation in human settlements in Ghana.

Conclusion

Due to poor physical and land use planning, landscapes in human settlements in Ghana have evolved chaotically. Lack of landscape management in human settlements adds to the burden and urgency of paying attention to sustainable landscape transformation. In this paper, the idea of landscape desirability was introduced and an approach for quantifying it was demonstrated using four communities in Cape Coast. Landscape desirability was represented by four factors (attractivity, wellbeing, dignity and eco-resilience), each with three sub-components. Overall, the

communities found their landscapes to be moderately desirable, indicating a need for improving landscape services. Moderate values for attractivity, wellbeing, dignity and eco-resilience indicate scope for improving the landscapes to a more desirable status, especially by covering the dust and improving the aesthetics (nature and beauty) and eco-resilience of the landscapes. Two factors, attractivity and eco-resilience, were the main contributors to the overall desirability index. Hence, attractivity and eco-resilience should be targeted for efforts aimed at enhancing landscape desirability in the studied communities. The idea and the approach presented in this paper can be easily replicated and used to quantify residents' perceptions of their landscapes to inform landscape planning, protection, transformation and management in Ghana. The results highlight the need for further, larger studies to understand people's perceptions and expectations of their landscapes, of what is or can be desirable, to support planning, transformation and management of landscapes in human settlements.

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